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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A01N 45/00, A01K 97/04 // (A01N 45/00, 43:38, 37:10, 37:06, 37:02, 33:04)		A1	(11) International Publication Number: WO 99/16315
			(43) International Publication Date: 8 April 1999 (08.04.99)
(21) International Application Number: PCT/GB98/02941		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 30 September 1998 (30.09.98)		Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	
(30) Priority Data: 9720814.4 1 October 1997 (01.10.97) GB			
(71) Applicant (for all designated States except US): KIOTECH LIMITED [GB/GB]; 22 Melton Street, London NW1 2BW (GB).			
(72) Inventor; and (75) Inventor/Applicant (for US only): DODD, George, Henry [IE/GB]; Tigh-Na-Fois, Mellon Charles Aultbea IU22 2JE (GB).			
(74) Agent: MURGITROYD & COMPANY; 373 Scotland Street, Glasgow G5 8QA (GB).			
(54) Title: PHEROMONE COMPOSITION			
(57) Abstract <p>The invention provides compositions formulated to attract fish, comprising at least one human female pheromone such as trimethylamine, pyrroline and salts thereof, steroids of the androstene family such as 5-α-androst-16-en-3-α-ol, heterocyclic compounds such as indole and skatole and alkanoic acid compounds such as 4-methyloctanoic acid. Compositions can be formulated as liquids for direct application to bait, hooks or flies. Plastic bait can be manufactured including the composition. The composition can be used to attract fish by fishermen and anglers or to guide fish into paths to enable them to cross dams.</p>			

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1 PHEROMONE COMPOSITION

2

3 The invention relates to compositions formulated to
4 attract fish, in order to capture them. More
5 particularly the composition may be used in a liquid
6 form to be applied onto or into bait, lures or flies
7 which are used by anglers and commercial fishermen
8 alike.

9

10 Angling and fishing are sports which attract a large
11 number of people. A wide range of bait, lures and
12 flies are marketed at these persons in order to provide
13 them with more success in catching fish.

14

15 Some organic compounds are known to be active in the
16 feeding response of some species by enhancing feeding
17 or attracting fish to a general area. They are known
18 to occur at low concentration levels in crustacea and
19 also in a range of decomposing animals. Such compounds
20 are small organic odorants.

21

22 It has been reported that women have a greater success
23 rate in catching salmon than male anglers (see *Salmon*
24 *and women*, W. Paterson & P. Behan, published by H, F &
25 G Witherby Ltd 1990).

1 It is an object of the invention to provide a
2 composition showing enhanced attracting effects on
3 fish.

4
5 It is another object of the invention to provide a
6 method to attract fish by using the composition of the
7 invention.

8
9 It is a further object of the invention to provide the
10 composition of the invention to be applied to bait
11 (live or dead), lures or flies (dry or wet) used in the
12 practise of angling or commercial fishing.

13
14 It has surprisingly been found that compositions
15 containing at least one human female pheromone presents
16 an unexpectedly good attractive effect on fish, and
17 particularly on salmon. Such compositions may be
18 applied on any kind of bait used by anglers and
19 fishermen.

20
21 Herein the term "pheromone" is taken to include amines
22 such as trimethylamine and pyrroline, and salts
23 thereof, steroids of the androstene family such as 5-
24 alpha-androst-16-en-3- α -ol, heterocyclic compounds
25 including nitrogen and/or sulphur such as indole and
26 skatole and alkanoic acid compounds such as 4-
27 methyloctanoic acid.

28
29 The objects of the invention are achieved with a fish
30 attracting composition comprising at least one human
31 female pheromone, or a synthetic nature-similar version
32 of the latter.

33
34 In one embodiment the invention provides at least one
35 female human pheromone together with an acceptable
36 carrier.

1 Alternatively the composition can comprise a synthetic
2 female pheromone with a carrier. Preferably the
3 carrier solubilises the compound.

4
5 Preferred carriers include aliphatic alcohols such as
6 ethanol, monoethylene glycol and propylene glycol.

7
8 It is preferred that the pheromone used in the
9 composition of the invention be at least trimethylamine
10 or one volatile steroid of the androstene family
11 together with at least one compound chosen from a
12 complex array of alkanolic acids, including those having
13 a carbon atom number ranging from C4 to C5 and
14 especially substituted acids having a carbon atom
15 number ranging from C8 to C10.

16
17 A particularly preferred composition comprises at least
18 one salt of trimethylamine (typically the
19 hydrochloride) and 5- α -androst-16-en-3- α -ol.

20
21 A preferred composition according to the invention may
22 comprise in association with nature-similar versions of
23 human female pheromones, a suite of other potent aroma
24 chemicals (referred to herein as Key Impact Odorants
25 [KIOs]) which occur in both fresh and decomposing
26 animal tissue.

27
28 These other KIOs can be special amines and associated
29 heterocyclic compounds including nitrogen and sulphur
30 such as indole and skatole. It is also preferred that
31 the odorant compounds be provided with concentrations
32 of several order of magnitude higher than the ones
33 which are found in conventional bait.

34
35 The composition of the invention can be used in various
36 embodiments.

1 In one embodiment the composition is a liquid which
2 bait, lure, fly, ground bait and/or hooks can be dipped
3 into or the liquid can be poured onto the bait, lure,
4 fly, ground bait and/or hooks.

5
6 The composition of the invention may also be formulated
7 as a spray to allow easy manipulation by the users and
8 could either be hand pumped or gas driven.

9
10 In a preferred embodiment the composition is formulated
11 to be injected into bait.

12
13 Alternatively the composition can be incorporated into
14 plastic bait.

15
16 To attract fish one may apply the composition of the
17 invention on a bait or a suitable support and provide
18 it in area where fish are used to be found.

19
20 The composition may also be applied directly onto bare
21 hooks.

22
23 The composition of the invention can be formulated for
24 a wide range of applications including combining with
25 floatant, spraying flies, combining with greasing or
26 degreasing agents to enable bait to float or sink as
27 required.

28
29 The formulation can also be combined with ground bait
30 and dried for storage purposes.

31
32 Formulations of the present invention are surprisingly
33 effective in aqueous solution. Whereas a preferred
34 carrier is ethanol and a basic formulation can include
35 a salt of trimethylamine in ethanol, in use the
36 formulation produces trimethylamine on contact with

1 water. In fishing, the formulation will be vastly
2 diluted in water and therefore it is most surprising
3 that use of the formulation can effectively enhance
4 fishing.

5

6 The pheromones which may be advantageously used in a
7 composition according to the invention include the
8 following:

9

10 Trimethylamine (TMA) (as derived from a salt of
11 trimethylamine such as the hydrochloride) is an
12 exceptionally interesting KIO pheromone. It occurs on
13 human skin and is especially important for females. It
14 is the characteristic odour of a menstruating female.
15 The odour profile is distinctive and is not shared by
16 closely related amines such as, for example,
17 dimethylamine. The aroma is that of fresh shell fish
18 at the threshold level. In fact it is thought that
19 most of the charm of oyster, scallops and the like
20 comes from TMA. The aroma changes with increasing
21 concentration and becomes increasingly unpleasant. At
22 a high level TMA will be perceived as an off-odour in
23 shell fish and the like, and as a sign of lack of
24 hygiene in a human subject.

25

26 The threshold concentration for humans is about 1ppb (1
27 part in 10^9) - this is low by olfactory standards.
28 There is, in fact, great individual variability and the
29 concentration varies around the mean figure by about 3
30 orders of magnitude. This gives rise to great
31 variability; for example, a crustacean may appear
32 delightful to a person of high threshold but may be
33 abhorrent to a person of low threshold (skin
34 sensitivity). See in that matter "Ageing and the Sense
35 of Smell" C, Van Toller, GH Dodd & A Billing, Charles T
36 Thomas, Publisher, Springfield, Illinois, USA, 1985.

1 Another interesting pheromone to be used in the fish-
2 attracting composition is 1-Pyrroline. This is a rare
3 and little studied human pheromone. It is unstable and
4 therefore very difficult to study. It is formed by
5 oxidation of precursor molecules such as 1,4-
6 diaminobutane and 1,4-diaminopentane. These amines
7 occur in a variety of human tissues, and can be formed
8 from appropriate amino acids.

9
10 In order to overcome the instability problem when 1-
11 Pyrroline is to be used in a fish-attracting
12 composition of the invention, the parent amines (i.e.
13 the above mentioned precursors) are incorporated at a
14 high level in the composition. They will slowly
15 oxidize and release the unstable active odorant.

16
17 These parent amines are also called respectively,
18 putrescine and cadaverine, for obvious olfactory
19 reasons and occurred in decomposing animal tissue. The
20 human threshold is in the ppb range.

21
22 A further preferred pheromone is the 5-alpha-androst-
23 16-en-3- α -ol. This pheromone is a well-known pheromone
24 which is found in both males and females but is thought
25 to be more important for women (in contrast to the
26 related steroid pheromone, alpha-androstenone). The
27 threshold for human is in the low ppb range. The odour
28 is usually described as musky.

29
30 A still further preferred pheromone is 4-Methyloctanoic
31 acid which is characteristic of the scalp odour and may
32 be found in gamey meat. The threshold is unusually low
33 for a fatty acid and is in the region of ppb. It is
34 has been reported that women are much more sensitive to
35 this odorant than men.

36

1 A particular composition according to the invention has
2 been tested in fishing experiments on the River Ness,
3 other rivers in the Highlands, and in Ireland and on a
4 variety of Lochs. Positive results have been obtained.

5
6 The composition of this particular non-limiting
7 composition is the following :

8	9	Component No	Name	Amount Required for 1000 litres of solvent (ethanol)
10				
11				
12				
13	1		Trimethylamine	7kg
14			hydrochloride	
15	2		1,4 diaminobutane	0.7kg
16	3		1,4 diaminopentane	0.1kg
17	4		indole	50 grm
18	5		skatole	40 grm
19	6		isovaleric acid	40 grm
20	7		4-methyloctanoic acid	10 grm
21	8		4-methylnonanoic acid	5 grm
22	9		phenylacetic acid	20 grm
23	10		2-methyl-E-butenic acid	5 grm
24	11		4-methylpentanoic acid	10 grm
25	12		2-methyl-2-pentenoic acid	10 grm
26	13		5-alpha-androst-16-en-3-alpha-ol	60 mg-6g

27
28 A more general preferred composition comprises

29	30	Component No	Name	Amount Required for 1000 litres of solvent
31				
32				
33				
34	1		KIO Pheromone	0.05-50kg
35	2		Alkanoic acid	5g-1.5kg
36	3		Amines	0.1kg-8kg

1 Even if a special emphasis has been given on the
2 utility of the composition in order to ease fishing it
3 is understood that the composition to attract fish as
4 above described may be used for other purposes. For
5 example it may be used to attract salmon into special
6 paths provided in order to help them to cross dams,
7 waterfalls or other obstructions.

8

9 Experimental Study

10

11 An initial study was carried out to establish a
12 relationship between the use of female pheromones at a
13 chosen concentration and the increase in the catch of
14 salmon, either by fish size or numbers caught using the
15 conventional rod and line method with a selected range
16 of hand tied salmon flies.

17

18 Three specialist salmon fly fishermen were chosen who
19 regularly fished prime salmon rivers, have extensive
20 combined specialist knowledge gained from 20 years of
21 fly fishing, fish a regular pattern over the entire
22 season, have experience of observing changes and
23 variations in fish runs and catch methods and were
24 willing to comply with strict rules with regard to
25 reporting procedures.

26

27 Rivers chosen for the study covered the entire salmon
28 cycle, i.e Spring-Summer and Autumn salmon runs,
29 January-September 1997.

30

31 Results

32

33 Some interesting findings came to light at the season
34 end:

35

1 Of the three subjects chosen, all had a significant
2 change in their catch pattern, (1) 43 salmon caught (2)
3 75 salmon caught (3) 15 salmon caught.

4
5 Subjects (1) and (2) fly fished the middle/upper
6 reaches of a major salmon river. The river is world
7 famous for the range of salmon fishing available.
8 Spring salmon run (10-25lbs) is moderate. Large runs
9 of Summer grilse (3-8 lbs) and a good run of Autumn
10 salmon (10-30 lbs).

11
12 Subject (3) fly fished a major East Coast spring salmon
13 fishery (10-30 lbs) This river has small runs of summer
14 salmon owing to licensed commercial fishing in estuary
15 waters.

16
17 In all cases the reports returned were similar with
18 more consistent catches particularly when fish were in
19 holding pools (when water levels receded after floods).

20
21 Catch summary (Salmon caught)

22			
23	Subject	1996	1997
24	(1)	37	75
25	(2)	18	43
26	(3)	9	15

27
28 No exceptional fish size was reported over that of the
29 1996 season.

30
31 Water levels for 1997 were consistently high by
32 comparison to 1996 resulting in concentration of
33 several salmon runs in holding pools throughout the
34 entire river system.

35
36 Current information on official commercial salmon catch

1 ventures for 1997 would indicate a 20% reduction on the
2 1996 season.

3
4 Water temperatures were slightly higher than previous
5 years.

6
7 Most salmon for this study were caught on an imitation
8 shrimp fly dressing of various sizes.

9
10 All subjects chosen for this study were male with
11 average age of 45 years.

12
13 All subjects chosen tie their own flies, however,
14 similar selected shrimp/prawn flies were distributed to
15 all.

16
17 Salmon flies used were purchased from local fishing
18 tackle shops.

19
20 The final results of this initial trial study would
21 indicate some relationship between the choice of fly
22 with sample female pheromone and the traditional fly
23 fishing method.

24
25 One fisherman has fished for Sea Bass (commonly known
26 as Salmon Bass) off the east coast for many years, with
27 varying success. This specialist fishing activity
28 fished off chosen rocky points in July/August would
29 normally yield 1-2 fish per outing. This year, using
30 identical fishing lures, substantially improved bass
31 catches were recorded with better than average sizes
32 using the female pheromone formulation described
33 herein. Other specialist bass anglers fishing the same
34 waters did not use the formulation and did not return
35 above average catches.

1 CLAIMS

2

3 1. A fish attracting composition comprising at least
4 one human female pheromone, or a synthetic nature-
5 similar version thereof.

6

7 2. A composition as claimed in claim 1 comprising a
8 human female pheromone or a synthetic nature-
9 similar version thereof together with an
10 acceptable carrier.

11

12 3. A composition as claimed in any of the previous
13 claims wherein the carrier is an aliphatic alcohol
14 or propylene glycol.

15

16 4. A composition as claimed in any of the previous
17 claims wherein the pheromone is at least one
18 volatile steroid of the androstene family together
19 with at least one compound chosen from a complex
20 array of alkanolic acids.

21

22 5. A composition as claimed in any of the previous
23 claims wherein the composition comprises
24 trimethylamine hydrochloride and 5- alpha-androst-
25 16-en-3- α -ol.

26

27 6. A composition as claimed in any of the preceding
28 claims wherein the composition is a liquid.

29

30 7. A composition as claimed in any of the preceding
31 claims which is formulated for injection into
32 bait.

33

34 8. A composition as claimed in any of claims 1-6
35 which is formulated as a spray.

36

1 9. Plastic bait including the composition as claimed
2 in any of claims 1-6.

3
4 10. Dried ground bait including a composition as
5 claimed in any of claims 1-5.

6
7
8
9
10
11

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INTERNATIONAL SEARCH REPORT

Internat. Application No
PCT/GB 98/02941

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A01N45/00 A01K97/04 //(A01N45/00,43:38,37:10,37:06,37:02,33:04)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A01N A23K A01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 561 871 A (GROUPE ETU REALISA NAVALES) 4 October 1985 see page 1, line 12 - page 4, line 28 see page 4, line 38 - page 5, line 6 see page 6, line 20 - line 30 see page 7, line 2 - line 11 see page 7, line 24 - line 38 see page 9, line 17 - page 10, line 6 ---	1,2
A	WO 83 00417 A (NORDTEND AS) 17 February 1983 see page 3, paragraph 2 - page 6, paragraph 1	4,5
X	see page 8, last line - page 10, paragraph 3; claims 7,9; examples 5E,,6M --- -/--	1-3,6-10



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Patent family members are listed in annex.

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Date of the actual completion of the international search

2 February 1999

Date of mailing of the international search report

11/02/1999

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NL - 2280 HV Rijswijk
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Fax: (+31-70) 340-3016

Authorized officer

Muellners, W

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PCT/GB 98/02941

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 219 416 A (NAVALES RECH GRP) 22 April 1987 see page 2, line 3 - line 60 see page 4, line 18 - line 59 see claims 22,23,32-34; examples 5,6,10,16,19 ---	1,2,6,7, 9,10
X	FR 582 224 A (M. M.-J. OLIVIERO & G.-J. CHAMAGNE) 15 December 1924 see the whole document ---	1,2,6-8, 10
X	EP 0 280 443 A (DALGETY LTD) 31 August 1988 see page 2, line 31 - page 3, line 5 see page 3, line 15 - line 37 see page 4, line 27 - line 36; examples I-III ---	1-3,6-10
X	WO 85 05014 A (COX JAMES P) 21 November 1985 see page 3, line 4 - line 10 see page 4, line 22 - line 25; example 3 -----	1,2

INTERNATIONAL SEARCH REPORT

Information on patent family members

Internat'l Application No

PCT/GB 98/02941

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2561871 A	04-10-1985	NONE	
WO 8300417 A	17-02-1983	AT 22775 T CA 1206874 A DK 38083 A EP 0084537 A FI 830330 A, B, US 4451460 A US 4534976 A US 4657759 A US 4668455 A	15-11-1986 01-07-1986 17-02-1983 03-08-1983 01-02-1983 29-05-1984 13-08-1985 14-04-1987 26-05-1987
EP 0219416 A	22-04-1987	FR 2588156 A DE 3681548 A JP 62091135 A OA 8422 A US 4752480 A	10-04-1987 24-10-1991 25-04-1987 30-06-1988 21-06-1988
FR 582224 A		NONE	
EP 0280443 A	31-08-1988	CA 1329539 A DD 273193 A DE 3889139 D DE 3889139 T FI 880751 A JP 63239206 A US 4818535 A ZA 8801069 A	17-05-1994 08-11-1989 26-05-1994 24-11-1994 19-08-1988 05-10-1988 04-04-1989 11-08-1988
WO 8505014 A	21-11-1985	AU 4292985 A BR 8506725 A DK 1386 A EP 0179144 A FI 855200 A JP 61502024 T	28-11-1985 23-09-1986 03-03-1986 30-04-1986 31-12-1985 18-09-1986

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